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erations and administrations so profoundly affect the welfare of mankind; and yet this body is held together as an organization of free men, each independent in his own sphere, governed only by a body of science, which is the common property of all, and the aggregated progress of research, invention, and exploitation. The efficient constitution and by-laws of this society are the formulated principles of science. For the organization of the labors of the past, the whip for the back has been the proper emblem of sovereignty. For the organization of the labor over which you preside, the hammer for the rock is the emblem of rule. You want in your deliberations no eagle on your mace, no unicorn and lion; but the balance and crucible properly symbolize to the world the power of your knowledge to control the industries of mankind.

Gentlemen, the industries which you control have their location in the foundations of the world. The valleys through which the living rivers roll, the prairies that spread their blossoms of beauty to the sun, the hills that billow with ripples of perpetual joy, the mountains where kissing clouds are transformed into cascades decked with rainbows, — all forms of land have their foundations laid in interlocked, crystalline gems, firmly set in a cement so delicately formed that the highest powers of the microscope fail to reveal its structure. The vast diastrophic powers of nature are forever engaged in mountain-building, against which the clouds hurl their storms to carve the hills and form the valleys; and, as the mountains appear above the level of the sea, the clouds bear them away on river-floods to build the fringing islands that are bathed by the tides. As these processes go on from geologic age to geologic age, the gold and the silver, the copper and the lead, the iron and the coal, and all the various substances with which you deal, are gathered in lodes, and segregated in bodies, and spread in strata, and are thus by nature separated from the great crystalline foundations of the world, and accumulated in masses. Then bounteous Nature repents of her generosity. Seeing what a store of wealth she thus brings together, she conceals it from the eye of the vulgar, and deems these treasures too precious to be intrusted to the ignorant. So she hides them away in fissures and in caves, she buries them under volcanic floods, she covers them with strata spread out by the waves of the sea; and she spreads over all a mantle of *débris* —of bowlders and gravels, and sands and soils; and over all she paints the bloom of the meadow, the variegated pattern of the copse, and the green of the forest; and then she smilingly exclaims, "My treasures are for those who can discover them. They who are worthy, by their intelligence may find; they who are unworthy, by their ignorance must remain destitute."

The people of the United States have chosen you — not by blind natural selection, but by intelligent choice—as their representatives; not to make laws, but to discover laws, — the laws of nature, by which all these concealed treasures may be brought to light, and fall into the possession of mankind. How well you administer the trust the six hundred millions of annual mining product in the United States attests.

I thank you, gentlemen, for this evidence of your labor and genius, and I congratulate your constituents for the choice they have made.

There is an organization with which I am connected, — the Geological Survey, — established by the general government, and endowed by the munificence of the people, that is working in cooperation with many other organizations established by the several States, the purpose of which is to aid you in your work. This organization is endeavoring to map the entire area of the United States for your purposes. It is endeavoring to trace the various geologic formations, and to discover their relations of sequence and interdependence. It is investigating the more recondite laws which control the distribution of values in the crust of the earth. All these things it is doing to aid you in developing the mining industries of America. Let me assure you, as a representative from this body, that we are informed with the same purposes as yourselves, and that we also believe that research is a boon to mankind, in part through the increase and diffusion of knowledge, but in larger part through the increase and diffusion of industrial blessings.

The history of the mining engineering of America is replete with the triumphs of science. In the Far West, where the soft breezes of the Pacific make music on giant Sequoian harps, there they harness rivers to monitors, and plough the mountains for gold; and the mining engineers, turning from these mighty tasks, engage in the deft and delicate work of extracting the grains of gold from the mountains of sand. Elsewhere they penetrate through shafts into subterranean depths, and employ, in gold and silver mining, machinery for power and efficiency elsewhere unparalleled. From the depths of the mountain they pump rivers thousands of feet to the surface, and they shoot cars of ore from the hell of darkness below, to the heaven of light above, as if they were playing with toy-guns, such Titan boys are they. Farther to the east, all over the land, the mining engineers are opening the great coal-fields, and gathering the sunshine which nature has been storing for unnumbered centuries in the depths of the earth. In the lost years the vegetation of America raised its verdant arms to heaven, and, grasping the glad sunlight, fell prostrate on the ground, and, still clinging to its boon of light and heat and power, was buried in great coal-formations beneath the accumulating sands of seas. This fossil power and heat and light are brought once more to the open day, and employed as powers for the machinery of America in warming the homes where wives and children dwell, and in illuminating the towns and cities of the land. These mining engineers have discovered that ofttimes the strata of the earth are domed by geologic upheavals, and that they thus constitute great natural receivers for the gases distilled in the depths below. Into these receivers they penetrate with their tubes; and, behold! light, heat, and power are given to the world. Time would fail to tell of all the triumphs of the mining engineers of America.

Gentlemen, I welcome you to Washington, and hope that your deliberations may be wise, and that your joy in our midst may be complete.

ELECTRIC WELDING.

IN accordance with instructions from the City of London Contract Corporation, Limited, Alexander B. W. Kennedy, F.R.S., vice-president of the English Institute of Mechanical Engineers, recently visited the United States in order to see what progress has been made in the direction of the practical carrying-out of the Thomson electric welding process. His report is dated Feb. 1. He visited the offices at Boston, and also spent about a week at their works at Lynn, Mass. He also visited five different works in the Eastern States (at Hartford, Ansonia, Brooklyn, and Trenton) where Thomson electric welders have been in use for some time (in some cases over a year) commercially.

The welding of iron and steel wire was one of the first matters successfully carried out by the company. He saw at the works of Messrs. Roebling, Sons, & Co., at Trenton, a welder which had been at work there for about thirteen months, for a great part of the time twenty hours per day, and the counter of which showed that 193,890 welds had been made with it. He also examined another wire welding machine at the Trenton Iron Works (Messrs. Cooper, Hewitt, & Co.), which had done about nine months' work, and had made 22,095 welds, and at the same works a portable machine, recently installed, which had made 9,022 welds. This last machine was so arranged that it could be carried about easily by two men, and connected with the mains at any part of the immense shop in which it was placed, so as to be used for mending or other welding, wherever required, without the necessity of bringing a heavy coil of wire to it. The managing partners of both the works spoke in the highest terms of the efficiency of the machines, and as to the great saving caused by their perfect utilization of short lengths and broken wires. The welding of brass and copper wire, especially the latter, naturally presented much greater difficulties than that of iron wire, but those seem now to have been overcome. Mr. Kennedy saw at the works of Messrs. Wallace & Sons, in Ansonia, a welder for this purpose, which was one of the first machines put down, and had made 30,415 welds (by register) during the last thirteen months in copper and brass wire; the latter, in certain cases, of the very hard and poor quality used for making pins. It was at the time being used for welding coils of brass wire into continuous mile lengths (twelve coils to the mile length). The wire was about an eighth of an inch in diameter, and of a very good quality of brass.

Mr. Kennedy had five short pieces of the brass wire welded together into a length of about 18 inches and the burrs removed (the whole operation only taking four or five minutes), and then took the welded pieces to the wire-drawer and had it passed six times through the dies, reducing its diameter from .12 of an inch to .031 of an inch. The existence of the four welds made no difference whatever in the drawing, which was continued until the diameter was reduced to about .002 of an inch.

In order more thoroughly to examine the conditions of straight butt welding in ordinary sections, he made a number of experiments at Lynn. In these experiments, as it was impracticable to measure the power going to the dynamo, he measured the net electrical power going to the welder, and also the exact time during which the current was supplied to the welder. These measurements were made on 25 pieces of wrought iron and steel bar of diameters varying from half an inch to two inches. No sensible difference between the iron and the steel in respect to power or time was found. The horse-power required varied, of course, according to the duration of the operation, and it has been found convenient to make this duration vary directly in proportion to the diameter of the bar, taking forty seconds as the standard time for an iron bar of one inch diameter. Keeping to these conditions, the horse-power per square inch of material remained very nearly constant for bars between half an inch and an inch and a half in diameter, its average value being 20.8. This corresponds to about 30 indicated horse-power at the steam-engine per square inch of welded section during the time that the current was on. This power can be very largely reduced without detriment to the weld, if the saving of power should be of greater importance than the saving of time. Of course, with slower working, the quantity of work which a machine will turn out is proportionately decreased.

The Thomson welders have been used for brazing as well as welding. At the immense bicycle-works of the Weed Sewing-Machine Company in Hartford, Conn., Mr. Kennedy found a brazing welder which had been at work about nine months, and which had made, by register, 29,800 separate operations. The managing director of the works said that he was now modifying the design of his bicycles throughout, with the special object of brazing or welding electrically as many joints as possible.

Inquiries were made as to the wages paid to the men who worked the welders at the different factories visited, and it was found that in no case had highly skilled labor been found necessary.

In summing up the whole matter, it may be said that the Thomson electric welding process has already, in America, been carried fairly beyond the experimental stage, and has achieved sufficient success in regular commercial work of somewhat varied kinds to warrant the belief that its industrial future is one of the greatest practical importance.

The process of welding in use by the Thomson Electric Welding Company has been fully investigated also by a United States naval board, consisting of George A. Converse, A. S. Greene, S. W. Armstead, and Gilbert Wilks, which convened at Boston, Feb. 10. They find that at the present time this process renders it possible, practically, to weld wrought-iron, cast-iron, brass, and copper rods from the size of the smallest electrical conductors in use for distributing purposes, to rods of two and a half inches diameter, and to weld pipes of larger sizes; to weld dissimilar metals, and pieces of different forms of cross-section; to join by welding the ends of wire cables, and to form welded rings of small or large diameter.

The board is "convinced that the Thomson welding process can be found of great utility to the naval service, both on shore and afloat, for the following reasons: it can be used (*a*) in welding breaks in rods without altering them either in length or shape; (*b*) for welding tubes; (*c*) for welding angles and shapes of intricate form; (*d*) for welding copper, brass, cast-iron, or other metals; (*e*) for heating metals for forging, tempering, and upsetting; and (*f*) for welding wire cables."

HEALTH MATTERS.

Consumption in Hayti.

THE natives of Hayti believe phthisis pulmonalis, according to Dr. R. P. Crandall (*Medical Record*, Jan. 11, 1890), to be both contagious and infectious, and fear it much more than yellow-fever or small-pox.

A native who is believed to be affected with this disease is avoided and shunned by all who know him, and becomes an object of prayer for the priests, and of pity for the people.

When a consumptive dies, the entire contents of the room in which he died are either destroyed or thrown into some place set aside by the government for that purpose. This sacrifice of property not only includes the furniture of a room, but also articles of value, such as jewelry, gold, and precious stones. This idea of destruction is carried to such an extent by some, that the paper is sometimes removed from the walls, and the floors torn up. Cases have even occurred where small houses, in which deaths from phthisis have taken place, were burned down to the ground to prevent the spread of disease.

"While riding one day near the suburbs of Cape Haytien, the commercial capital of northern Hayti," writes Dr. Crandall, "I came across a sort of marsh or land of mud known as the Cimetière des Chevaux. Scattered over its surface, and half sunk in its muddy depths, were innumerable household articles, furniture of all kinds, sewing-machines, pianos, book-cases, books, etc. Here and there also appeared the whitened skeletons of animals. My curiosity being excited, I asked of a native standing near the reason for this apparent waste of property. He informed me that the Cimetière des Chevaux was a repository for the dead bodies of anmials, and for every thing that was found in the room of one who had died from *la poitrine* ('consumption'). When asked if any thing was ever removed from the cemetery, he answered that nothing would induce a Haytien to even touch any thing that had been placed there. I found this to be strictly true, as on several occasions I offered natives sums of money to bring me articles from the cemetery, and was always refused with looks of horror and repugnance. On careful investigation, I found that phthisis was regarded as contagious by all classes throughout Hayti."

THE HOUR AT WHICH DEATH OCCURS.—From a study of fifteen thousand cases, extending over a period of twelve years, Dr. J. F. Burns states, in the *New York Medical Journal* for Jan. 4, 1890, that it would appear that death occurs seemingly without any particular predilection for any certain hour, and that the number of deaths for each hour is very evenly proportioned, considering the large number of cases taken and the time covered. The only very positive conclusions the author has formed from the figures are (1) that the idea that more deaths take place in the early morning hours is an erroneous one; (2) if stimulants are to be pushed in disease during these hours, the practice must be justified upon some other ground than to avert the possibility of danger supposed to be very probable at this period; (3) that the vitality of an individual in disease is not regulated by the same influences or subject to the same laws that govern the vitality of a healthy human being, the normal equilibrium maintained in health between the mental and physical states being altered.

PUTREFACTION AT GREAT DEPTHS IN THE SEA.—Dr. Regnard has raised the question, says the *Bristol Medical Journal*, as to whether a corpse which sinks to a very great depth is preserved indefinitely or otherwise from putrefaction. According to his researches, published in the archives of the Biological Society of Paris, putrefaction does not take place in decomposable substances submitted to a pressure of 600 to 700 atmospheres. These figures correspond to a depth of 6,000 or 7,000 metres at sea. From these experiments it must be concluded, according